



Monitoring Salt Marsh Vegetation at George Washington Birthplace National Monument

2012 Summary Report

Natural Resource Data Series NPS/NCBN/NRDS—2013/442



ON THE COVER

Salt marsh at George Washington Birthplace National Monument.
Photograph courtesy of Northeast Coastal and Barrier Network.

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Abstract

The Northeast Coastal and Barrier Network (NCBN) began monitoring salt marsh vegetation and nekton on a biennial basis at George Washington Birthplace National Monument (GEWA) in 2008. This report summarizes the third year of vegetation data collected during the summer of 2012. Nekton monitoring was not conducted due to time constraints.

Forty-nine vegetation plots were sampled on August 7, 2012. The percent cover of each vegetation species and non-vegetation cover type within each 1 m² plot was visually estimated using a revised Braun-Blanquet method. Twenty-four vegetation species and three non-vegetation cover types (bare ground, wrack & litter, and water) were observed.

Introduction

National Park Service (NPS) managers need accurate information about how, when and why natural systems change over time in order to make sound management decisions. To address this need, the NPS initiated natural resource monitoring through the Natural Resource Challenge. The Inventory and Monitoring Program (I&M), the key component of this effort, organizes 270 park units into 32 networks tasked with conducting long-term ‘vital signs’ monitoring (Fancy et al. 2009). Vital signs are defined as measurable, early warning signals that may indicate change in the long-term health of natural systems. Early detection of potential problems allows park managers to take steps in restoring or maintaining the ecological health of park resources.

The Northeast Coastal and Barrier Network (NCBN) consists of eight parks extending along the Northeast Atlantic Coast. Vital Signs chosen as part of the Network’s monitoring plan include salt marsh vegetation communities, nekton communities, essential estuarine water quality parameters, and specific coastal geomorphologic features (Stevens et al. 2005). Detailed monitoring protocols have been developed and implemented in the eight parks. This annual report summarizes salt marsh vegetation data collected at George Washington Birthplace National Monument (GEWA), according to the protocol developed by James-Pirri et al. (In Review)—Monitoring Salt Marsh Vegetation: A Protocol for the National Park Service’s Long-Term Monitoring Program, Northeast Coastal and Barrier Network.

Methods

Permanent Site Selection

One permanent salt marsh site (Dancing Marsh) was selected for vegetation and nekton monitoring at GEWA (Figure 1). Nekton was not sampled in 2012 due to time constraints. Detailed information about the site selection process and sampling design can be found in the Salt Marsh Vegetation (James-Pirri et al. In Review) and Nekton Protocols (James-Pirri et al. 2012).

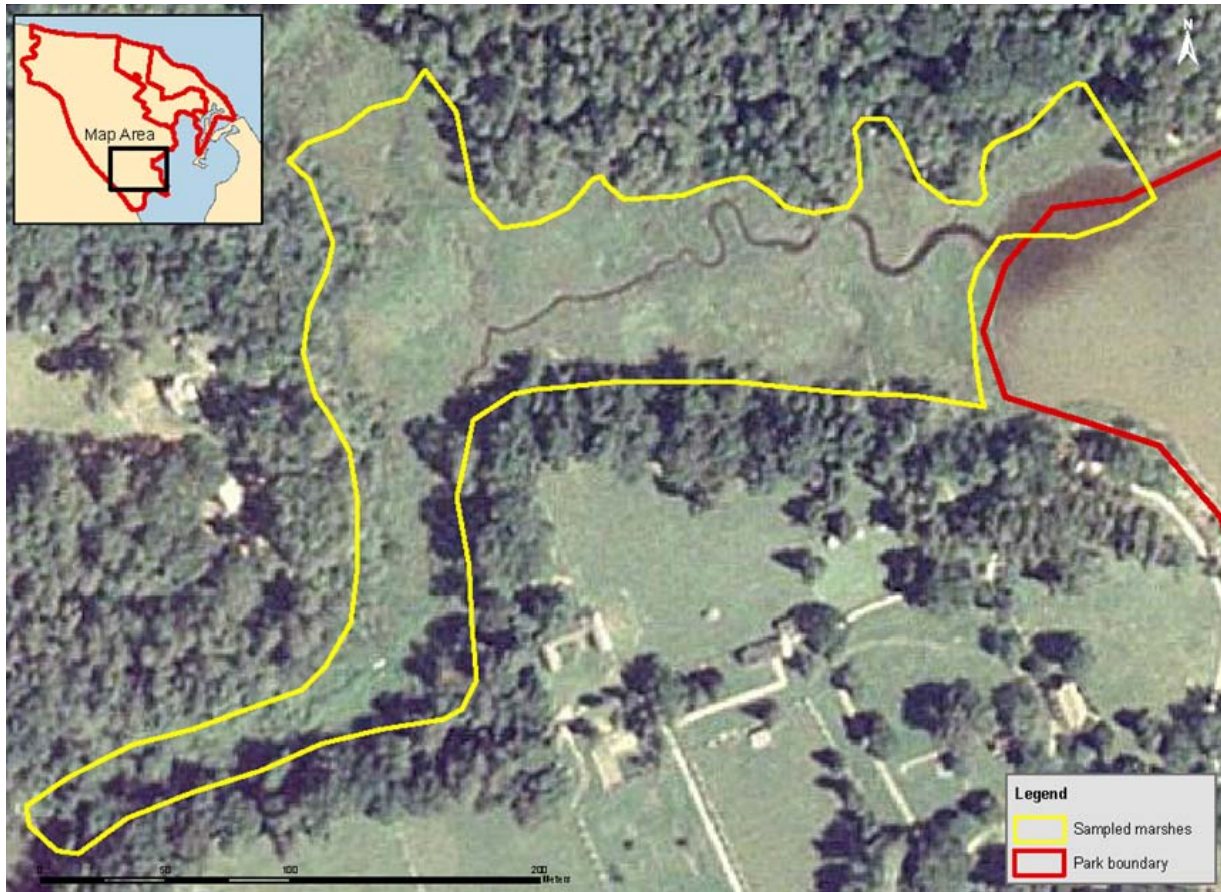


Figure 1. Aerial view and location of the permanent monitoring site (yellow shaded area) established by NCBN at George Washington Birthplace National Monument (GEWA), Virginia in 2008. This site is monitored biennially.

Vegetation Plot Selection and Data Collection

Vegetation plots ($n = 49$) were sampled on August 7, 2012. Ten transects extending from bay to upland were systematically placed based on a single random start. Plots were located by treating the total length of all transects as a single transect and randomly selecting points (*i.e.*, plots) along this total length. This combination of systematic transects and replicate plots is necessary to ensure interspersed plots throughout the site, thus providing a representative sample of all salt marsh communities (*e.g.*, low marsh, high marsh).

For each plot, all vegetation species and non-vegetation cover types were recorded (Table 1), and the estimated percent cover was determined using a modified Braun-Blanquet cover scale (0: 0%; 1: <1%; 2: 1-5%; 3: 6-25%; 4: 26-50%; 5: 51-75%; 6: 76-100%), (Kent and Coker 1992).

Table 1. Definition of standard cover type categories used in the Northeast Coastal and Barrier Network salt marsh vegetation monitoring protocol (James-Pirri et al. In Review).

Live vascular plants	Identified by species (herbaceous and shrubs).
Standing non-living vascular plants	Identified by species (e.g., <i>S. alterniflora</i> Not Living). This category only includes standing dead (attached) plants that are from a previous year's growth. There may be some dead leaves from this year's growth (e.g., the ends of leaves or leaves that are being replaced by new growth, etc.). In cases where dead leaves are from the current growing season, plant cover is recorded as live.
Macroalgae	Identified by species. This category generally includes the rockweeds (e.g., <i>Fucus</i> , <i>Ascophyllum</i>). Microalgae (e.g., diatom mats) and fine filamentous algae are not included in this category.
Bare ground	Includes mud, sand, microalgae cover, etc. These are areas that are not flooded with water and are devoid of standing live, standing dead, or macroalgae. There can be a thin film of surface water within the bare ground category.
Water	Permanent standing water is identified in plots that are partly within a creek, ditch, marsh pool, or flooded panne.
Wrack/litter	Wrack is material that has floated into the plot. This is generally dead (not attached) plant material, but could also be trash. Litter is dead plant material that is highly decomposed and is no longer attached.
Trash	Items such as logs, old piers, tires, etc.
Rock	Boulders or rocks can be found on the surface of northern New England marshes.

Data Summary

Vegetation

Vegetation data were recorded using the modified Braun-Blanquet scale as described above (Kent and Coker 1992). For summary purposes, each Braun-Blanquet value was converted to the midpoint of the percent range it represented (Table 2) as described in Wikum and Shanholtzer (1978).

Table 2. Modified Braun-Blanquet scale and corresponding midpoint values for determining percent cover of salt marsh vegetation.

BB Value	Percent Cover	Midpoint
0	0%	0%
1	< 1%	0.50%
2	1 - 5%	3%
3	6 - 25%	15.50%
4	26 - 50%	38%
5	51 - 75%	63%
6	76 - 100%	88%

Wikum and Shanholtzer (1978) outline a method for calculating an importance value for each species. So as not to confuse this value with ecological importance, we refer to it as a ‘relative prevalence’ value. Although Wikum and Shanholtzer (1978) present their importance value as a sum of the percent frequency and percent cover values, we have chosen to average these values so that relative prevalence is on a more readily interpretable percent scale. We present the relative percent prevalence for each species and non-vegetation cover type as the average of the relative percent cover and the relative percent frequency. A detailed description of the analyses and formulae are presented in the salt marsh vegetation protocol (James-Pirri et al. In Review).

Relative percent cover is the percentage of all plots that each species covers relative to all other species present in the plots. The sum of all relative percent cover values for all species and non-vegetation cover types equals 100%. Relative percent frequency is the number of plots where each species is present, relative to all other species observed in the plots. The sum of the relative percent frequency values for all species and non-vegetation cover type equals 100%.

In addition to relative percent prevalence, we report the average percent cover of each species and non-vegetation cover type for all plots combined. Because the relative percent prevalence incorporates both percent frequency and percent cover, it provides information about how a species is distributed (*i.e.*, its ‘patchiness’) throughout the salt marsh and may differ substantially from the average percent cover for a given species.

If any vegetation species in the sample plots are listed by the United States Department of Agriculture (USDA) or the Commonwealth of Virginia as exotic, invasive, threatened,

endangered, or rare, these species are noted in the vegetation data summary. Information about individual plant species is available online (USDA 2013). A list of plants classified by the Commonwealth of Virginia as exotic or invasive is available on the Virginia Department of Conservation and Recreation (VA DCR) website (VA DCR 2009). Plants listed by the Commonwealth of Virginia as threatened, endangered, or rare can be obtained from an online report produced by the VA DCR (Townsend 2009). Lastly, if any species from one of the above categories is observed, these plots are noted in Appendix A which includes a table of all vegetation sample plots and their respective Universal Transverse Mercator (UTM) coordinates.

Results

Vegetation

A summary of the 2012 GEWA vegetation data is provided in Table 3. Species are grouped by salinity tolerances (USDA 2013). As explained in the Data Summary section, the relative percent prevalence combines information about how much of each site each species ‘covers’ relative to all other species present and how frequently it appears throughout the site relative to all other species present. Twenty-four vegetation species and three non-vegetation cover types were observed and recorded. None of the vegetation species observed in the 2012 plots are federally or state listed as exotic, invasive, threatened, endangered, or rare (USDA 2012, Townsend 2009, VA DCR 2009).

Table 3. Average percent cover (Avg. % Cover $\pm$ SE), frequency, and relative percent prevalence of each plant species and non-vegetation cover type observed at GEWA in 2012. Data were summarized over all 49 plots. Percent cover was estimated using the midpoint values of Braun-Blanquet percent ranges (Table 2). (NL) indicates standing non-living vegetation.

Cover Type		Avg. % Cover $\pm$ SE	Frequency	Rel. % Cover	Rel. % Freq.	Rel. % Prevalence
Salinity Tolerance						
Species	Common Name					
Vegetation		72.9 $\pm$ 3.7	49	70.3	76.6	73.4
High Salinity Tolerance		35.1 $\pm$ 4.4	37	33.9	33.0	33.5
<i>Spartina cynosuroides</i>	big cordgrass	26.3 $\pm$ 3.8	31	25.3	14.8	20.1
<i>Atriplex patula</i>	spear saltbush	3.9 $\pm$ 1.0	23	3.8	11.0	7.4
<i>Schoenoplectus robustus</i>	saltmarsh bulrush	2.4 $\pm$ 0.8	10	2.3	4.8	3.5
<i>Spartina alterniflora</i>	saltmarsh cordgrass	2.2 $\pm$ 1.4	4	2.2	1.9	2.0
<i>Distichlis spicata</i>	spikegrass	0.3 $\pm$ 0.3	1	0.3	0.5	0.4
Medium Salinity Tolerance		31 $\pm$ 3.9	44	29.9	34.7	32.3
<i>Amaranthus cannabinus</i>	tidalmarsh amaranth	13.4 $\pm$ 2.4	32	13.0	15.2	14.1
<i>Kosteletzkya virginica</i>	salt marsh mallow	4.6 $\pm$ 1.3	15	4.4	7.1	5.8
<i>Zizania aquatica</i>	annual wildrice	5.6 $\pm$ 2.6	7	5.4	3.3	4.3
<i>Typha angustifolia</i>	narrowleaf cattail	2.9 $\pm$ 1.2	7	2.8	3.3	3.0
<i>Typha angustifolia</i> (NL)	narrowleaf cattail (NL)	1.4 $\pm$ 0.9	3	1.4	1.4	1.4
<i>Polygonum punctatum</i>	dotted smartweed	0.5 $\pm$ 0.3	4	0.5	1.9	1.2
<i>Baccharis halimifolia</i>	Eastern baccharis	1.3 $\pm$ 1.3	1	1.2	0.5	0.8
<i>Polygonum sagittatum</i>	arrow-leaved tearthumb	0.6 $\pm$ 0.4	2	0.6	1.0	0.8
<i>Lythrum lineare</i>	wand lythrum	0.3 $\pm$ 0.3	1	0.3	0.5	0.4
<i>Schoenoplectus americanus</i>	American bulrush	0.3 $\pm$ 0.3	1	0.3	0.5	0.4
Low Salinity Tolerance		2.7 $\pm$ 1.2	8	2.6	3.9	3.2
<i>Hibiscus moscheutos</i>	rose mallow	0.8 $\pm$ 0.4	5	0.8	2.4	1.6
<i>Peltandra virginica</i>	green arrow arum	1.1 $\pm$ 0.8	2	1.1	1.0	1.1
<i>Mikania scandens</i>	climbing hempvine	0.8 $\pm$ 0.8	1	0.7	0.5	0.6
No Salinity Tolerance		2.0 $\pm$ 1.2	4	2.0	2.5	2.2
<i>Decodon verticillatus</i>	swamp loosestrife	0.6 $\pm$ 0.4	2	0.6	1.0	0.8

Table 3. Average percent cover (Avg. % Cover $\pm$ SE), frequency, and relative percent prevalence of each plant species and non-vegetation cover type observed at GEWA in 2012. Data were summarized over all 49 plots. Percent cover was estimated using the midpoint values of Braun-Blanquet percent ranges (Table 2). (NL) indicates standing non-living vegetation (continued).

Cover Type							
Salinity Tolerance							
Species	Common Name	Avg. % Cover $\pm$ SE	Frequency	Rel. % Cover	Rel. % Freq.	Rel. % Prevalence	
<i>Acer rubrum</i>	red maple	0.8 $\pm$ 0.8	1	0.7	0.5	0.6	
<i>Leersia oryzoides</i>	rice cutgrass	0.3 $\pm$ 0.3	1	0.3	0.5	0.4	
<i>Quercus phellos</i>	willow oak	0.3 $\pm$ 0.3	1	0.3	0.5	0.4	
Unknown Salinity Tolerance		2.0 $\pm$ 1.2	4	2.0	2.5	2.2	
<i>Polygonum arifolium</i>	halberd-leaved tearthumb	1.1 $\pm$ 0.8	2	1.1	1.0	1.1	
<i>poacea</i>	true grass	0.6 $\pm$ 0.4	2	0.6	1.0	0.8	
<i>Cyperus species</i>	Cyperus species	0.3 $\pm$ 0.3	1	0.3	0.5	0.4	
Non-Vegetation		14.9 $\pm$ 3.0	24	14.4	12.9	13.7	
<i>water</i>	water	10.3 $\pm$ 2.9	13	9.9	6.2	8.1	
<i>bare ground</i>	bare ground	4.6 $\pm$ 1.2	14	4.5	6.7	5.6	
Incidental Cover		15.9 $\pm$ 3.3	23	15.3	11.0	13.2	
<i>Wrack & litter</i>	wrack/litter	15.9 $\pm$ 3.3	23	15.3	11.0	13.2	

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Appendix A: Vegetation plots sampled at GEWA in 2012

Table A-1. Station IDs and coordinates of vegetation plots sampled at GEWA in 2012, UTM, Zone 18, NAD 83, meters.

Station ID	UTM X (east)	UTM Y (north)	Station ID	UTM X (east)	UTM Y (north)
G1V1012_2012	332007	4228318	G1V3512_2012	332006	4228318
G1V112_2012	331978	4228369	G1V3612_2012	332146	4228384
G1V1212_2012	332055	4228336	G1V3712_2012	331901	4228298
G1V1312_2012	332100	4228344	G1V3812_2012	332055	4228336
G1V1412_2012	331985	4228360	G1V3912_2012	332101	4228348
G1V1512_2012	332124	4228309	G1V4112_2012	331816	4228155
G1V1612_2012	331941	4228214	G1V412_2012	331923	4228252
G1V1712_2012	331911	4228274	G1V4212_2012	331922	4228261
G1V1812_2012	331808	4228154	G1V4312_2012	331911	4228175
G1V2012_2012	331970	4228380	G1V4412_2012	332110	4228336
G1V2112_2012	331924	4228362	G1V4512_2012	332031	4228378
G1V212_2012	332031	4228377	G1V4612_2012	331993	4228348
G1V2212_2012	331925	4228360	G1V4712_2012	332087	4228374
G1V2312_2012	331806	4228154	G1V4812_2012	331903	4228298
G1V2412_2012	331914	4228270	G1V4912_2012	331860	4228160
G1V2512_2012	331899	4228192	G1V5212_2012	331947	4228314
G1V2612_2012	331952	4228306	G1V5312_2012	331864	4228162
G1V2712_2012	331893	4228199	G1V5412_2012	331923	4228256
G1V2812_2012	331924	4228253	G1V5512_2012	332063	4228321
G1V2912_2012	331923	4228251	G1V5912_2012	331928	4228357
G1V3012_2012	331860	4228161	G1V612_2012	332124	4228308
G1V3112_2012	332118	4228322	G1V712_2012	332194	4228398
G1V312_2012	331980	4228365	G1V812_2012	332007	4228318
G1V3312_2012	331859	4228160	G1V912_2012	331901	4228194
G1V3412_2012	331894	4228308	G1V3512_2012	332006	4228318